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## The Examination of Milk for Tubercle Bacilli.*

### A Survey of Experience and Results.

By D. R. Wood, F.I.C., Somerset County Laboratory.

Having examined some fifteen hundred samples of milk for tubercle bacilli, I thought that some account of the results obtained and of lessons learnt might not be without interest to others.

The large majority of the samples were from the milk of herds of cows in this county; a systematic examination of these herds has been undertaken with the object of finding and eliminating cows giving tuberculous milk. Some of the samples were examined under the provisions of the Tuberculosis Order and some for private individuals, but these will not concern us much in this paper.

The following table (Table I) shows the number of herds whose milk was tested by me and the number in which tubercle bacilli were found in the four years 1926 to 1929; for comparison, results obtained with mixed milk samples taken from churns in other localities are given in Table II.†

TABLE I.

TUBERCLE BACILLI IN MILK OF SOMERSET HERDS.

| Year | Number of herds tested | Number of herds giving tuberculous milk | Percentage of herds giving tuberculous milk. |
|---|---|---|---|
| 1926 ... | 180 | 4 | 2·2 |
| 1927 ... | 230 | 5 | 2·2 |
| 1928 ... | 273 | 6 | 2·2 |
| 1929 ... | 317 | 8 | 2·5 |

The percentage of Somerset herds giving tuberculous milk is remarkably constant, and is decidedly lower than that of other localities for mixed milk samples. The two classes of samples, however, are not really comparable, for with mixed milk samples, the milk is frequently mixed in bulk in large tanks and many churnsful may be contaminated by the milk of a single cow.

Table III gives a summary of the results of investigation of 30 Somerset herds whose milk was found to contain tubercle bacilli.

RELATIVE VALUE OF MICROSCOPICAL AND BIOLOGICAL TESTS.—It was realised from the outset that it was perfectly useless to attempt to find tubercle bacilli in the milk of herds by microscopical examination (the milk of every herd was centrifuged for one hour at a speed of 3,500 r.p.m., the deposit of 100 c.c. suspended in 1 c.c. of sterile water and inoculated into a guinea-pig)—but it was not quite realised how little one can rely upon finding tubercle bacilli microscopically in the milk of single cows. In the investigation of the first herd (No. 1) the milk of each cow was examined microscopically only, and no tubercle bacilli were found. With No. 3 tubercle bacilli were found microscopically after using a concentration method. With No. 4 tubercle bacilli were not found microscopically in the first examination of the milk of two cows containing these bacilli, but only upon subsequent examination of other samples, and then only by the use of a concentration method; while of the remaining 17 samples from single cows, undoubtedly shedding tubercle bacilli in their milk, only four showed these bacilli microscopically; or, counting the three additional samples mentioned in Table III in which tubercle bacilli were

TABLE II.

TUBERCLE BACILLI IN MIXED MILK SAMPLES FROM VARIOUS LOCALITIES.‡

| Locality | Period. | Mean percentage containing tubercle bacilli. | Maximum and minimum annual percentages. |
|---|---|---|---|
| Liverpool (County samples) ... ... ... | 1919-1927 | 7·4 | 3·1-10·45 |
| ,, (Town samples) ... ... ... | do. | 6·4 | 2·5-15·2 |
| Aberdeen ... ... ... ... ... | 1922-1927 | 5·5 | 3·0- 8·3 |
| Salford (Cheshire milk) ... ... ... | 1920-1927 | 11·5 | 8·9-14·2 |
| ,, (Lancashire milk) ... ... ... | do. | 3·35 | 1·3- 8.0 |
| Birmingham ... ... ... ... ... | 1918-1927 | 7·5 | 3·5- 9.6 |
| Newcastle-upon-Tyne ... ... ... ... | do. | 4·95 | 2·9- 8·0 |
| London County Council ... ... ... | do. | 5·3 | 3·1- 7·8 |
| Manchester ... ... ... ... ... | do. | 10·6 | 5·3-14·9 |
| Monmouthshire ... ... ... ... | 1927 | 1·4 | — |

* Reprinted from *The Analyst*, September, 1930. Vol. lv. No. 654.

† The annual percentages of herds in this country giving tuberculous milk have admittedly been calculated from a rather small number of samples. In the first year little confidence was placed in the figure obtained, but when an almost identical figure was obtained for each of the three following years and the total number of samples for the four years amounted to 1,000, there was every indication that a figure between two and three per cent. for the tuberculous herds was reliable. Since this paper was written information has come to hand of the results of the London County Council for 1928 and 1929 for samples of milk coming from Somerset, showing 3·13 per cent. positive, the number of samples examined being 256. This is in very fair agreement with my results. The percentage containing tubercle bacilli from another county was 9·25.

‡ Taken from *The Prevention of Human Tuberculosis of Bovine Origin*, by W. G. Savage.

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TABLE III.

INVESTIGATIONS OF SOMERSET HERDS GIVING TUBERCULOUS MILK.

| Serial Number of Herd. | Date of examination | No. of cows in Herd. | No. of cows whose milk was separately tested. | No. of cows showing T.B. in milk. | | Outcome of investigation. | *Post-mortem* findings by Veterinary Surgeon. |
|---|---|---|---|---|---|---|---|
| | | | | Microscopically | By inoculation. | | |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| 1 | Mar. 1926 | 25 | 8 | 0 | 0 | | |
| | | | 17 | 0 | 0 | | |
| 2 | May ,, | 22 | 22 | 0 | 0 | F | |
| 3 | Sept. ,, | ? | 1 | 1 | not inoculated | S | General t. and udder t. |
| 4 | ,, ,, | ? | 2 | 0 | 2 | S | (1) do. do. |
| | | | | | | | (2) do. and supra-mammary t. |
| 5 | Jan. 1927 | 20 | 5 | 0 | 0 | F | |
| 6 | Feb. ,, | 32 | 4 | 0 | 0 | F | |
| 7 | July ,, | 65 | 6 | 0 | 1 | S | General t. and udder t. |
| 8 | Aug. ,, | 27 | 3 | 0 | 0 | Scl | Cow (dry) found with general t. and thickened quarter. |
| 9 | ,, ,, | 46 | 3 | 0 | 1 | S | Advanced t. and udder t. |
| 10 | ,, ,, | 15 | 2 | 1 | not tested | S | do. do. |
| 11 | July ,, | 46 | 3 | 0 | 0 | Scl | Cow killed under T.O. |
| 12 | Nov. ,, | 16 | 4 | 0 | 0 | Scl | ,, ,, ,, ,, |
| 13 | June ,, | 63 | 5 | 0 | 1 | S | Advanced t. and udder t. |
| 14 | Nov. ,, | 20 | 2 | 0 | 0 | | |
| | Mar. 1928 | | 3 | 0 | 0 | S | |
| | Aug. ,, | | 19 | 0 | 1 | | (1) Udder tuberculosis. |
| | | | | 0 | 1 | | (2) Tuberculosis lesions but none in udder. |
| 15 | May 1928 | 15 | 3 | 0 | 0 | F | |
| 16 | ,, ,, | 20 | 2 | 0 | 0 | Sc | Dry cow killed under T.O. and t. udder found |
| 17 | June ,, | 27 | 3 | 0 | 1 | S | Advanced t. but no evident udder t. |
| 18 | July ,, | 36 | 6 | 0 | 0 | | |
| | Feb. 1929 | | *8 | 0 | 1 | S | Advanced t. and udder t. |
| | | | | 0 | 1 | | do. and slight udder t. |
| 19 | Sept. 1928 | 21 | 2 | 0 | 1 | S | Advanced t. and udder t. |
| 20 | Sept. ,, | 47 | 6 | 0 | 0 | | |
| | | | *8 | 1 | 1 | S | Udder t. and other lesions. |
| | | | *4 | 0 | 0 | | |
| 21 | Feb. 1929 | ? | 2 | 1 | 1 | S | Advanced t. and udder t. |
| 22 | May ,, | ? | 4 | 0 | 0 | F | |
| 23 | Aug. ,, | ? | 3 | 0 | 2 | S | (1) Advanced t. no udder t. evident. |
| | | | | | | | (2) ,, udder very healthy. |
| 24 | ,, ,, | ? | 1 | 0 | 1 | S | General t. and udder t. |
| 25 | ,, ,, | 32 | 2 | 0 | 1 | S | No P.M. |
| 26 | ,, ,, | 35 | 3 | 1 | 1 | S | t. of udder and other lesions. |
| 27 | ,, ,, | 29 | 3 | 0 | 0 | Scl | Cow sold and killed and found to have advanced t. |
| 28 | Oct. ,, | 26 | 2 | 0 | 0 | | |
| 29 | Nov. ,, | 30 | 1 | 0 | 0 | | Further investigation in hand. |
| 30 | Dec. ,, | 32 tested in sections | | | | | |

S indicates success in detecting at least one cow yielding tuberculous milk ; Scl indicates that this was accomplished by clinical examination ; and F indicates failure in detecting any such animal.

t. stands for abbreviation for tuberculosis, and T.O. for Tuberculosis Order.

* These cows were selected from the herd by the examination of the milk of the herd in sections, the milk of each cow of the sections showing tubercle bacilli was then tested separately.

NOTES.—Herd No. 1. These were microscopical examinations only.
No. 2. Milk of herd re-examined later and found negative.
Nos. 4 and 14 (1). Tubercle bacilli found microscopically in later samples from the three cows.
No. 11. Udder macroscopically not tuberculous.
No. 12. do. do. do.
No. 15. Milk of herd re-examined and found negative.
No. 22. Milk of herd examined in sections and all found negative.

TABLE IV.

| Area. | Positive by inoculation. | | | Negative by inoculation. | | Percentage + by inoculation and — microscopically. |
|---|---|---|---|---|---|---|
| | + microscopically. | — microscopically. | doubtful. | +microscopically. | doubtful microscopically | |
| Somerset ... ... | 8 | 15 | 0 | 0 | 5 | 62·5 |
| Wilts. ... ... ... | 19 | 22 | 0 | 2 | 0 | 53·6 |
| Reading Lab. ... | 24 | 50 | 0 | — | — | 67·6 |
| Total ... ... | 51 | 87 | | | Average | 63·0 |

found later microscopically, the total number becomes 23, and the number showing tubercle bacilli microscopically, eight, or 37·5 per cent. Savage (*loc. cit.*, p. 121) gives a tabular summary of the relative frequency with which tubercle bacilli have been found microscopically (1) by me (" Somerset "), (2) in the county of Wiltshire, and (3) by Mr. A. T. R. Mattick, of the Reading Laboratory. As he indicates, however, the higher proportion which I found positive microscopically was due to the inclusion of special samples from very advanced cases. Table IV reproduces Savage's table, excluding these very advanced cases (many of which did not require bacteriological diagnosis) and bringing results up to date. It will be noted that the results are in very good agreement, and one can reasonably assume that in only one case in three, at the best, evidence will be obtained microscopically of the presence of tubercle bacilli.

The Cytology of Tuberculous Milk.—The great advantage of finding tubercle bacilli microscopically, when possible, is the saving of time it effects. When it is discovered that a herd is giving tuberculous milk it is impossible to stop the sale of milk pending the investigation of the milk of the individual cows; this takes four to five weeks by guinea-pig inoculation. But, as microscopical examination cannot be relied upon, attention was given to the cytology of tuberculous milk. One expects to find an increase of cells in tuberculous milk from single cows; this increase, however, may be very slight and more than compensated by the variation in cellular contents under normal conditions of the cow. On one occasion samples of milk were collected separately from the four quarters of a cow whose milk was positive by inoculation, and the following results were obtained:—

| Quarter | Right fore. | Left fore. | Right hind. | Left hind. |
|---|---|---|---|---|
| Cells per c.c. ... ... | 50,000 | 5,000 | 400 | 20,000 |
| Tubercle bacilli microscopically ... ... | absent | absent | present | absent |

On another occasion the milk of twelve cows of a herd giving tuberculous milk was examined separately, special attention being given to the increase of cells, and the following results were obtained:—

| Cow No. | Cells. | Result of inoculation tubercle bacilli. |
|---|---|---|
| 1 | Normal in number ... ... ... ... ... ... ... | absent |
| 2 | Increased in number ... ... ... ... ... ... | do. |
| 3 | „ „ „ ... ... ... ... ... ... | do. |
| 4 | Slightly increased in number ... ... ... ... ... | do. |
| 5 | Normal in number ... ... ... ... ... ... ... | present |
| 6 | „ „ „ ... ... ... ... ... ... ... | absent |
| 7 | „ „ „ ... ... ... ... ... ... ... | do. |
| 8 | Increased in number ... ... ... ... ... ... | present |
| 9 | Normal „ „ ... ... ... ... ... ... | absent |
| 10 | „ „ „ ... ... ... ... ... ... | do. |
| 11 | Increased „ „ ... ... ... ... ... ... | do. |
| 12 | „ „ „ ... ... ... ... ... ... | do. |

Attention was also given to the predominant type of cell present in tuberculous milk. Generally speaking, the predominant cells in acute infections are the polymorphonuclear leucocytes, and in the chronic infections such as tuberculosis the lymphocytes. One would expect, therefore, a predominance of mono-nuclear cells in tuberculous milk, but this is far from being the case. Buchanan describes a large mono-nuclear cell as characteristic of tuberculous udders, and uses Papenheim's stain, but my experience with this stain and Jenner's stain was very disappointing.

The Limitations of Veterinary Inspection*.—When a herd giving tuberculous milk had been discovered, it was considered reasonably certain at the outset that by careful veterinary inspection of every cow in the herd those with tuberculous udders would be detected, or at least suspected; in fact, that such pleasing success in spotting the right cows as we had in cases three and four would be common experience. Comparison of the figures in the fourth and sixth vertical columns of Table III—cows suspected and cows with tuberculous udder—shows that this was far from being the case. The cow's udder is a bulky organ, and the lesions may be very slight; in fact, pin-points, as was shown in case 24, where the opened udder appeared quite normal without a hand lens. Three cases were particularly intractable, Nos. 14, 18 and 20. With No. 14 a herd of 20 cows was three times reported from Bristol to contain tubercle bacilli, and each time every cow was inspected by a veterinary surgeon. Two, three and four cows on the respective occasions were suspected and their milk submitted for examination, but with negative results both microscopically and by inoculation. Finally the milk of every cow was tested and tubercle bacilli were found in the milk of two. Even then the veterinary surgeon was so convinced that one of these cows was healthy that the examination was repeated, and tubercle bacilli again found before the cow was destroyed.

The tuberculin test merely indicates whether or not a tuberculous lesion is present. About 40 per cent. of cows give a positive reaction, and the test is of very little use by itself in deciding whether a cow has a tuberculous udder or even comes under the Tuberculosis Order.

The Examination of the Milk of Herds in Sections.—With No. 18, a herd of 36 cows, at the first inspection six cows were considered possibly responsible and their

* It is only fair to say that such was my experience up to the time of writing, when only part-time veterinary surgeons were employed. The county has since then appointed a whole-time officer specialised in the work, and it appears probable that my estimate of the value of inspection will, in future, be distinctly modified.

milk was examined, but with negative results. The herd was then divided into five sections, and the milk of each section tested. Tubercle bacilli were found in the milk of one section, representing eight cows. The milk of these eight cows was then tested separately, and tubercle bacilli were found in the milk of two.

The method of examining the milk of a herd in sections was adopted again in case No. 24, and tubercle bacilli were found in two sections. Every cow's milk of these two sections was subsequently tested, the cow responsible for the presence of tubercle bacilli in the milk of one of these sections only was discovered, the four cows of the second section all giving negative results by inoculation.

One is driven to the conclusion from these three instances that the only logical and safe procedure is either to test the milk of every cow of the herd separately or in groups of about six, and then every cow of the positive group or groups, for, if the herd is merely inspected, no cow giving tuberculous milk may be found amongst the animals suspected by the veterinary surgeon, and even if such a cow is found there is no guarantee that another cow may be not shedding tubercle bacilli as well.

Review of the Success or Failure of Investigation of Herds giving Tuberculous Milk.—Column 7 of Table III shows the outcome of each investigation at a glance. The letter S indicates success in detecting at least one cow yielding tuberculous milk, $S_{cl}$ indicates that this was accomplished by clinical examination, and F indicates failure in detecting any such animal. It will be noted that there were twenty-one successful investigations and five failures, excluding the first case when my technique was in a somewhat experimental stage and microscopical examination only was made of the majority of samples tested. Of the five failures, numbers five and six were quite probably due to some of the inoculated guinea-pigs dying prematurely. In numbers 2, 15 and 22, a possible explanation is that the milk of the original sample was infected from the excreta, for the milk of every cow was tested either individually or in groups and the full period of incubation of inoculated guinea-pigs was given. But there are two other possibilities; the possibility of failing to get tubercle bacilli from the udder of a cow in the early stages of infection, through insufficient massage in milking, and failure to keep track of all the cows contributing to the original sample. In compliance with the Milk and Dairies Order, 1925, 24 hours' notice must be given to the farmer of the intention to inspect his herd; this gives a dishonest farmer the opportunity of disposing of a cow with a suspicious udder, which is very undesirable; no such opportunity is given in Scotland. It will be noted that a later examination of the milk of two of these five herds gave negative results.

Such, then, are the results obtained by the examination of the milk of 1,000 herds. There are some 7,000 herds in this county; at the present rate, therefore, 28 years will be required to examine the milk of every herd, by which time, of course, every cow will be replaced. This cannot be regarded as an adequate measure for the elimination of tuberculous milk; if this is to be achieved, something like seven times as many examinations should be made.

# Calcium Metabolism.

By W. P. Blount, M.R.C.V.S., Derby.

The present-day veterinarian is so frequently brought into contact with diseases involving a knowledge of chemical physiology that it may not be out of place to summarise the more important facts concerning calcium.

Now that it has been shown how important a part calcium plays in the pathology of milk fever (Dryerre and Greig; Little and Wright; Sjollema and Seekles, etc.), the country practitioner needs to appreciate some of these relationships, just as the small animals' specialist does with his ever-present canine rachitis. Other common conditions involving essentially the metabolism of calcium are:—Lambing sickness of ewes (Greig), tetany of equines (Montgomery), eclampsia of the sow (Davidson), hypocalcæmia of puppies (Chambers), etc. Calcium is found abnormally deposited in ossification of the lateral cartilages; in the formation of caseous deposits after tubercle infection, in arterio-sclerosis, and ankylosis, etc.

Physiologically, calcium plays an important part in the formation of bony tissues; in the clotting of milk and the coagulation of blood; whilst its absence from normal saliva appears to be closely associated with dental caries: Delezenne claims that calcium salts activate trypsinogen; it also assists in the maintenance of systolic tone, where it acts by augmenting the heart beat (similar to stimulation of the sympathetic accelerator nerves), and it also possesses a sedative action on nerve tissues in general.

There are many important factors concerned in the absorption and utilisation of calcium. Assuming that the supply of lime in the food is adequate (which is not necessarily the case with animals fed on foods grown on lime-deficient pastures; so-called "acid-soils," with which the farmer is familiar, where finger-and-toe disease of turnips occurs), its digestion is usually not delayed, but the absorption from the intestines may be considerably activated by lowering the *p*H of the surrounding medium. In other words, the more acid the contents of the bowel the better the absorption of calcium and phosphorus into the general blood stream. This is one of the later known facts which hitherto had not been considered of value dietetically. Apparently calcium exists in the blood as tricalcium phosphate, which is not very soluble (Howland), but, under the influence of carbonic acid, calcium bicarbonate and calcium hydrogen phosphate are formed, both of which are highly soluble and consequently available for the production of free calcium ions. Again it will be appreciated that as the presence of acid is necessary for optimum calcium metabolism, alkalæmia will tend to lower the blood calcium content. It is believed that where persistent vomiting occurs with the loss of hydrochloric acid from the body, the bicarbonate content of the blood plasma is raised and so the available supply of calcium diminished. Another example of this temporary alkalæmia is seen after excessive pulmonary ventilation. Here the carbon dioxide content of the alveolar air and arterial blood are lowered and there is a consequent mild alkalæmia.

Two even more important factors are concerned in the metabolism of calcium, namely:—Vitamin D, and the parathyroid glands. Vitamin D appears to be largely

concerned with the absorption of calcium from the blood stream into the tissues, and is one of the essential features in the pathology of rachitis where there is a deficient, irregular and patchy ossification of the epiphyseal cartilages. Vitamin D is produced normally by the ultra-violet rays of the sun acting on certain "sterols": notably ergosterol of the skin and cholesterol of the red blood corpuscles. Artificially it can be produced by allowing active light rays to irradiate cholesterol; more recent work, however, has shown that it is not cholesterol but another sterol, probably occurring as an impurity, known as "Lego-sterol" (Revis) which becomes activated.

A diet which contains an unbalanced quantity of calcium in relation to phosphorus is rapidly effective in producing rachitis, but vitamin D appears to be able partially to rectify this state.

The prolonged irradiation of foodstuffs with the object of forming anti-rachitic substances is not to be favoured, for, as the vehicle is of a fatty nature, undesirable physical and chemical changes occur, such as rancidity, and oxidation.

Mitchell, in his article on "Shivering," etc., in the *Veterinary Record*, No. 25, Vol. X, p. 535, quotes the very interesting work of M. Mellanby concerning those substances which appear to be antagonistic to vitamins and which have been termed "Toxamins." A specific anti-calcifying toxamin is known to be present in many of the cereals and is therefore obviously bound up closely in the metabolism of lime and phosphorus. The bad effects of a high cereal diet have long been known in the production of rickets (Wright, Samson), but not until the recent work of Mellanby were we able more clearly to visualise the cause.

The intimate relationship between the endocrine organs and calcium is not yet fully established. It is known that the parathyroid glands are concerned in the mobilisation of blood calcium (Vines), because injections of suitable extract raised the percentage of blood calcium in most experimental animals (Korenchevsky). Whether these glands regulate the passage of lime from the body store houses to the blood plasma, or whether they merely control the percentage of free calcium ions is not yet established. If the glands are extirpated a fatal tetany ensues in which the blood calcium level falls consistently.

A second function of the parathyroids is concerned with the detoxication of certain endogenous poisons—by-products of nitrogenous metabolism—a typical example of which is guanidine (Paton and Findley). It can be seen, therefore, that should the condition of tetany be encountered in veterinary practice, a diet low in protein but rich in calcium would be favourable.

Other endocrine glands have relationships to the metabolism of calcium, for it is known that rachitis is found much more readily in carnivora if the thymus is underactive (Lucien and Parisot). Bony changes, such as gigantism and acromegaly, are known to be associated with hyperactivity of the anterior lobe of the pituitary body, but how these effects are brought about is still uncertain. Has the pituitary a direct effect on calcium metabolism, or is its effect indirect *via* the parathyroids?

The excretion of calcium normally takes place both by the large bowel and by the urine, but this is considerably influenced by certain factors. It is known that excess of thyroid secretion or of the internal secretion of the ovaries (œstrum : menstruation) stimulates the excretion of calcium; this is also seen after the removal of the thymus (Brown, Langdon) or after the removal of one suprarenal gland (Bell, Blair); whereas, after ovariectomy, there is a retention of calcium in the body (Crofton), thus proving a further intimate relationship between the endocrine organs and calcium. Vassall has shown that animals with a well tolerated partial parathyroidectomy develop a severe or even fatal tetany at a subsequent pregnancy or lactation; the drain on the calcium stores being effected by the fœtus and milk respectively. Owing to the very high mineral content of colostrum and ordinary milk we have one of the commonest sources of loss of calcium from the body of the lactating dairy cow—a fact repeatedly emphasised by Dryerre and Greig in this country in the pathogenesis of milk fever. It would appear essential, therefore, that in order to replace such losses, the "dry" period in heavy milkers should be extended to at least five or six weeks wherever practicable.

Although present-day therapy usually consists in the subcutaneous or intravenous injection of soluble calcium salts, it can readily be recognised that there will soon be made practicable corrective methods for other factors concerned in the metabolism of calcium.

Biochemists have recently attempted to estimate the amounts of free ionisable calcium, and the combined calcium, separately; but Dryerre has pointed out that too much reliance cannot be placed on the present published figures owing to possible errors in the principles and technique involved.

## The Royal Veterinary College.

### Appeals at Chertsey.

Speaking at the recently-held annual dinner of the Chertsey Agricultural Association, Sir Edward Stern, bart., d.l., of Fan Court, Lyne, who recently gave a handsome donation to the fund, appealed for support for the project for rebuilding the Royal Veterinary College. Sir Edward said the building was tumbling down and had to be rebuilt and endowed. For this purpose upwards of £300,000 was needed, and the Government had given some help, but at least £60,000 more was needed at once. Owners of race-horses, masters of hounds, breeders of horses and cattle surely could contribute £1,000 each to that important work. England was the stud farm of the world, so they must have the best veterinary college possible.

Mr. F. W. Willett, m.r.c.v.s., the Association's honorary veterinary surgeon, thanked Sir Edward for his remarks about the condition of the college, and also for his handsome donation to the fund. The walls of the college, he pointed out, had to be shored up to prevent them from falling, and it was a disgrace that such a condition of affairs should obtain in this country. He (the speaker) had been in several countries in Europe and had visited the veterinary schools there. In most cases they had splendid buildings, equipment and surroundings, and these schools were supported by the State, whilst the students were also assisted during their college course by their Governments. If every agriculturist, owner of race-horses and pedigree stock would contribute £1 it would go far to help that most necessary undertaking. The veterinary profession had been of great assistance to stock owners, and if those present could influence anyone to help they would be doing infinite good, not only to the cause, but to themselves. Their mission was not only to cure disease, but to prevent it, and it was necessary that veterinary science and research work should receive the greatest encouragement.

# Pathological Changes Found in Horses Affected with "Shivering," and their Significance.

## West of Scotland Division, N.V.M.A., Discussion* on Professor Wm. M. Mitchell's Paper.

The discussion on the paper presented by Professor Mitchell to the West of Scotland Division, N.V.M.A., at Glasgow, on May 21st, 1930, and reproduced in the *Veterinary Record* of June 21st (Vol. X, No. 25, pp. 535-537), was opened by Mr. James Macfarlane, of Glasgow.

Mr. Macfarlane said :—

In rising to open the discussion on Professor Mitchell's paper, I wish to thank him for giving us such an interesting addition to what has already been published on his pet subject, the osteo-arthritic prevalence in horses and its association with shivering.

When asked by Mr. Campbell to open this discussion I agreed because, firstly, I was partly responsible for the election of Mr. Campbell to his present post as our Secretary, and secondly, I thought I was on safe ground with such straightforward and *simple* subjects as osteo-arthritis and shivering, but you can imagine my dismay when I discovered that in this paper Mr. Mitchell has taken fresh flight and landed me in a quagmire with " deficiency disease " and the question of " disease resistance " as companions.

I must confess to feeling in rather a mental maze over some of the terms used, such as villi, toxamins, retro-peritoneal, histo-pathology, fragmentation and sclerostomiasis. Is it to be wondered at when you take into consideration the fact that I qualified in 1903? (Laughter.)

We are inclined to become hidebound in our views and to hold certain theories without question; this paper therefore, is doubly welcome as it acts as a stimulant to fresh thought and should make us more thorough in our *post-mortem* examinations—not finishing when we find out the actual cause of death. Professor Mitchell has unique opportunities of studying the complete carcass; a busy practitioner cannot afford the time required to have every brain removed or the vertebræ stripped of muscle, and again one must remember that cast horses have a considerable value and thus many animals are sold that would make interesting autopsies.

While on the subject of *post-mortem* examinations, I wish to make one or two observations. Over 50 per cent. of all our deaths are caused by alimentary or bowel trouble, twist of the large and small intestine being commonest, enteritis next, followed by rupture of the intestine, ruptured stomach and intestinal calculi, in the order named. I agree with Professor Mitchell that organic heart disease of the horse is rare. My general experience is that intestinal worms are seldom found when one expects to find them and one may get them in very fat-conditioned horses. Only twice in mature horses (that I can recall from memory) was the cause of death directly due to the presence of worms.

There is a condition with which I meet frequently but of which notice is seldom taken in text-books, namely, an accumulation of pieces of fence, tin, short lengths of wire and nails, mixed with coarse sand and coal dust, lying next to the mucous membrane lining the double colon.

Is this due to our animals being fed on a deficiency diet or to the fact that treacle water is spread over their chop each night, causing them to lick the manger clean?

I will leave the question of heredity and its connection with shivering and the other diseases scheduled under the Horse-breeding Act, 1919, to be dealt with by Professor Robb and other practitioners from country districts.

I ask Professor Mitchell if another side might not be shown, namely, that horses with inherited shivering are subject to ostitis and arthritis owing to the nature of their disability. If arthritis is common to all shiverers, then how is it that the arthritis never causes lameness? I disagree with the essayist's opinion that concussion has been over-rated as an exciting cause in the subjects under discussion, because my experience in practice, confirmed on *post-mortem*, is that ostitis (purely a concussion disease) is much more common than arthritis in the limbs. On *post-mortem* I have often been struck by the clean, healthy joints one sees even in old horses; indeed, xcept in accidents and kicks, one seldom sees caries in a joint.

In my opinion, the closely allied trouble of " jinked back " or immobility renders horses more useless for contractors' work than are the shiverers we unwittingly purchase. By immobility I mean that lack of control of the hind legs in backing, turning, and holding back a load that is sometimes left as a legacy after severe attacks of influenza and pneumonia. In my view, these cases never recover to do serviceable work, and if Professor Mitchell could elucidate the cause during this present investigation we would all be grateful to him.

Regarding deficiency diets, Professor Mitchell quotes from experiments in feeding dogs on cereals, but is this fair? Food that suits herbivorous animals, certainly would not be sufficient to keep carnivorous animals healthy. Oats and hay are the diet of at least nine-tenths of all the contractors' horses in Scotland and when, as in this season, prime quality is the rule, then you find your stud, while still being fed the same quantities, in excellent condition and the bulk of the animals with fine, silky coats. Whether vitamin D should get the credit I am not sure, but I do know that the buying of A1 quality, in whatever class of food you use, always pays.

We will all agree that the feeding of succulent and fresh food such as turnips and grass when available is an advantage, but horses soon tire of them. This raises the question as to how long vitamins remain in the system. Much more work of a tedious and intricate nature will require to be done before Professor Mitchell's theories can be definitely established. I am sure that we will, all of us, try and put him in touch with suitable subjects.

Professor William Robb : While one may not agree with the deductions that Professor Mitchell has formed as the result of his investigations into the cause of shivering, one is bound to admire his patient and exhausting efforts.

Other workers into nervous affections, such as shivering and stringhalt, found hæmorrhage around the sciatic nerve and fibrosis, just as Professor Mitchell has done in these investigations. They contented themselves with these findings and let the matter rest, but our investigator of to-day is not content with a *post-mortem* examination of a limited character, and proceeds to a more general examination of the body.

From his previous article, reproduced in the *Veterinary Record* of February 1st last, I formed the opinion, rightly or wrongly, that Professor Mitchell was inclined to believe that the primary cause of this disease was an osteo-arthritis with pressure on the adjacent nerve. After reading his second article and the details of the changes in organs and tissues of the body, which in his own words amount to " a veritable pathological museum," I will leave it to him to explain if these changes are only to be found in shiverers. Further on he says that he gives it as his opinion that this multiplicity of lesions must be due to a factor which, if we could eliminate it, might prevent shivering, and he stresses the factor of diet.

It is not my intention to follow him through his discussion on toxamins and vitamins, but might I be allowed to put to him the fact that all horses are more or less brought up under the same conditions of sunlight and food and yet certain types and breeds are practically free from either detectable osteo-arthritis or nervous disease. Again, if the common factor of deficiency of vitamin A in oats allowed a toxamin in oats to produce the nervous symptoms seen in shivering, does it not seem reasonable to assume that almost every horse would be attacked with this disease?

I am glad to see that he has stated in his second article that although he found osteo-arthritis present, there were

* At a meeting held at the Glasgow Veterinary College on June 25th, 1930.

no marked exostoses on the vertebræ that could possibly cause pressure on lumbar or sacral nerve roots. It is well that this has been made clear, as there was a general idea that this was likely to be his conclusion as to the common cause of shivering. I, for my part, could not accept such a view, as it would not explain those cases of shivering we occasionally find in foals, when attacked with sore throat or strangles. Even in those cases of horses aged 2, 4½ and 5 years old, in which he found osteo-arthritis of a very generalised character, can he say that this condition is peculiar to shiverers or not?

Now anyone, by visiting a knackery, can easily satisfy himself that osteo-arthritis, exostoses and anchyloses are common features in horses, especially after doing some years of service, and how few of them are shiverers!

I cannot see the relationship between the presence of osteo-arthritis (without pressure) and shivering, so I had better leave it to Professor Mitchell to explain. When dealing with this in his reply, I would ask him not to confine his explanation to nervous affection of the legs, but to deal with the affection when attacking the lips, eyes and ears. Professor Mitchell has noted a point I wish to make, that although gross changes were found in many joints, there was an absence of lameness in all the shiverers that he had seen.

He also noted that, in the cases of the three young shiverers he mentioned, well-marked side bones were present, and concludes that this feature is closely allied to osteo-arthritis. While this latter deduction may be correct, it brings us back to the original argument—what is the relationship between osteo-arthritis and shivering? I, personally, could point out to him certain families of Clydesdales noted even at three years old for becoming affected with sidebones, and yet these families were free from shivering. On the other hand, certain families have a bad history as to shivering being present in the family tree, and they are free from side-bones.

You will observe that his conclusions are marked as provisional, and I have formed the opinion that at present he is inclined to the belief that shivering is merely one of the local manifestations of a general disease, due to the lack of a disease-resisting factor.

On the question of heredity being a predisposing cause of shivering, side-bones and osteo-arthritic deposits, he seems to me to set aside the theory of ossific diathesis, hereditary tendency, taint or predisposition, and to favour the view of lack of a hereditary disease-resisting factor. Concussion, he states, has been over-rated as an exciting cause even in phalangeal affections. I admit that it is a very convenient explanation to give when one finds, say, a young thoroughbred affected with "sore shins," and I must press the point that it is very difficult to get away from such a conclusion when one knows that such an affection is more likely to result from galloping on hard going.

Might I put the following question to Professor Mitchell—What does he mean when he says that hæmoglobinuria in the horse may merely be a very acute form of the disease under consideration?

I would also be glad to have his views on why it is we might easily detect shivering when there is another disease affecting the animal, yet when the exciting cause disappears, all evidence of shivering is absent? Does it not seem strange that in an affection in which, we are told, pathological lesions extend from ulceration of the stomach to fibrosis of the sciatic nerve, the symptoms are not of a more permanent character?

If shivering and stringhalt are due to a common cause, why is it that stringhalt is a comparatively mild affection as compared with shivering, is more easily detected in most cases, and that cases are relieved by peroneal tenotomy, while in cases of shivering it is useless?

When we turn to Professor Mitchell's views on the etiology of shivering, we find he takes a very wide view as to the cause, *viz.*, first, some factor of a toxæmic nature; second, the factor of diet, and third, the absence of the hereditary disease-resisting factor. Personally, I think he is quite right to keep an open mind when carrying out research work, and the chances of a successful result will be much greater. I have read Professor Mitchell's paper with pleasure and I hope he will be encouraged by to-day's criticism to persevere in his good work. (Hear, hear.)

Mr. J. D. Pottie said he was convinced that both shivering and stringhalt were hereditary. He agreed that shivering originated in the spinal cord. It was due, he said, to a diffusion into the cord or canal, interfering with nervous functioning. Bony enlargements in the legs had nothing to do with shivering. The only satisfactory way of dealing with this condition was to stop breeding from shiverers.

Mr. David Brown wished to thank Professor Mitchell for his most interesting and valuable paper. He had not come prepared to make much comment, but he would say that in his opinion it was thoroughly established that shivering was hereditary. There were many difficult points in connection with the disease, as, for instance, why colds, severe colics and other conditions, were so liable greatly to aggravate shivering.

Mr. Esmond Brown remarked that though that subject was somewhat out of his line, he had read Professor Mitchell's paper with much interest, and now that it was put forward for discussion he had been wondering how Professor Mitchell would "get away with it." (Laughter.) There was still much work to be done, but he hoped their investigator would continue his researches and now and again, as he had done that day, pay an *interim* dividend.

Mr. Wm. Peirson spoke of a condition met with in Australia and New Zealand, called "Australian Stringhalt." It occurred among horses on certain pastures, and disappeared when the horses were removed and given a change of feeding. Apparently the condition was due to a toxæmia; it was not hereditary. This condition might be considered as somewhat parallel to those Professor Mitchell was investigating. In his opinion, Professor Mitchell was on the right lines.

Mr. Peter Wilson expressed his appreciation of the essayist's labours. It was agreed that the origin of the diverse conditions described was obscure, but he suggested that they might be due to a toxæmia dependent on infection of the navel in early life. He instanced cases of bursal enlargement of the stifle joint, often without lameness, appearing in animals of a year old, two years old, or more, where *post-mortem* examination showed evidence of a persistent suppurative condition in the navel.

Mr. Donald Campbell remarked that Professor Mitchell's investigation was a very far-reaching one, and it was difficult to say where it would yet carry him. His observations so far published covered only 6 horses, and many more cases would have to be studied before conclusive results could be expected. It seemed likely, from their essayist's work, that veterinary surgeons would have to revise their views on many matters. For instance, after what they had heard that afternoon, they would have to consider whether grunting in horses should not now be regarded as an unsoundness. He hoped Professor Mitchell would continue his interesting and important studies.

Professor G. W. Weir said: I have been very interested in Professor Mitchell's paper and have enjoyed the remarks of those who have joined in the discussion, and am now eager to hear how Prof. Mitchell is going to reply to all the questions. I had not intended to try to discuss the paper, but one thing which struck me, on looking over the specimens so kindly brought forward so as to make the subject more interesting, was the fact that a stifle joint could be so much diseased, and the animal not show any lameness, and yet, if an animal affected by chorea or shivering is injured on the affected leg it shows exaggerated symptoms of pain and lameness.

Much has been said about the probable cause or causes of the disease. I am inclined to believe very strongly in diet deficiency as a cause of many diseases.

If I may be excused, I will briefly give a few facts about an epidemic which undoubtedly was a diet deficiency disease.

A few years ago I was asked by the proprietor of a stud of horses, at some distance from my district, to go and inspect his animals, as he had been troubled for about a year with lamenesses. His veterinary surgeon had recently died, and he had himself been laid aside by an

accident and had been allowing his son, a lad of 19 or 20 years, to look after the horses.

Almost every other day one or more of the animals would come home lame—some in front and some behind.

One animal had to be destroyed on the street because of what was said to be a fracture of the hock joint. I made several visits to this place and found all the lamenesses to be due to joint trouble—hip, shoulder and fetlock, mostly. I had also two colic cases which showed peculiar symptoms and decided that they were animals showing another symptom of the same disease. Meanwhile, I had done my best to find the cause of all the trouble, and had called two veterinary surgeons in consultation. At last I advised a different method of feeding, and almost immediately the cases of lameness became fewer, until there were no new cases.

Many of the horses never fully recovered. One broke down at work quite suddenly, and on *post-mortem* showed rupture of the flexor tendons at the fetlock joint. The head of the os suffraginis was ulcerated and eroded, and had simply sawn through the tendons.

The feeding of these animals had been altered by the proprietor's son immediately he took charge, I presume on the idea of economy, from chop feeding to clean oats and bran plus long hay. They were getting too large a quantity of bran and not enough oats and hay. I am afraid that without my notes on the cases I have given rather a scrappy description, but I am convinced that diet deficiency is a great factor in the cause of disease and might easily be a contributory factor in the cause of the conditions described by Professor Mitchell. Again thanking him for his paper and for having caused such an interesting discussion, I have pleasure in calling upon him to reply.

### The Reply.

Professor Mitchell expressed his pleasure at the reception of his paper and the valuable discussion it had produced, but stressed the fact that he had as yet not come to any definite conclusion as to the cause of shivering.

The general belief that shivering is definitely hereditary has a certain amount of support from statistical proof, especially in Clydesdale horses, said Professor Mitchell, but my belief is that there must be some exciting factor to produce the varied pathological changes I have described and demonstrated. That the changes in the tissues are not confined to shiverers alone is shown in the figures given of horses which were not shiverers, showing fibrosis in the sciatic nerve. In a previous paper I have stated that, out of 116 horses, I collected from 33 of them a portion of the vertebral column showing osteo-arthritic change and that practically more of these were shiverers.

The fact that shivering becomes worse when a sufferer becomes affected by some temporary intercurrent disease is in keeping with my idea that the exciting cause of shivering is a toxæmia, again using this term in its widest sense, and the coincidence of a febrile attack merely adds to the circulating toxin and local congestion, thus causing the signs of shivering to become worse. As recovery is made from the intercurrent disease there will be a corresponding alleviation of the signs of shivering, though very often an animal is left permanently worse than before.

In some very slight cases of shivering I believe that if the exciting cause, "the toxæmia," ceases to act, so long as the gross damage to nerve trunks is slight it may be impossible to detect any clinical signs, and such cases may be put down as recoveries.

The relationship between osteo-arthritis and shivering is probably due to the irritant factor being blood-borne, setting up lesions in the joints and bones on the one hand, and an interstitial neuritis on the other. In the demonstration I showed a section of liver from a shiverer with a well-marked endarteritis obliterans in a branch of the hepatic artery, which supports the idea of a circulatory toxin affecting the whole body.

The passing reference I made in my paper to hæmoglobinuria is largely an hypothesis, as it struck me that, as chronic manifestations of a circulatory disease are common, an acute form might occasionally occur, and as hæmorrhages are so often noticed in the chronic osteo-arthritic conditions, especially in shiverers, it appears to me possible that the excessive hæmorrhages in hæmoglobinuria might be of similar origin.

I agree with Mr. Wilson's suggestion that many ills of the horse arise from umbilical infection at birth, but I would go even further and suggest that nutrition of the fœtus *in utero* leaves it at birth incapable of resisting completely infections occurring at that time.

Mr. Peirson and Professor Weir both bring forward very suggestive evidence that feeding can play a very important part in many so-called surgical conditions. To have brought out the valuable contribution of Professor Weir was in itself sufficient recompense for my visit to the West.

# Clinical and Case Reports.

## An Unusual Sequel to Castration.

**By C. Burston, M.R.C.V.S., and J. H. Wood, M.R.C.V.S., St. Neots, Hunts.**

*Subject.*—Two-year-old hunter colt.

*History.*—Castrated by the local castrator on June 25th, in the standing position, and using clams. The castration wounds had healed quickly and well, but since castration the colt had gradually lost condition and appeared depressed. Some three or four days previous to calling us the owner had noticed a swelling high up in the off-side flank. First visited on July 29th.

*Symptoms.*—On first examination the colt proved to be in very poor condition and presented a very dejected appearance. Pulse, 40; temperature, 102° F. He showed slight signs of abdominal pain, and when standing the off hind leg was held backwards and outwards. Scrotum and cords normal. Examination of the flank showed a large, tense swelling, devoid of heat or pain. Rectal examination revealed the presence in the abdominal cavity of a large tense body, some 20-in. in diameter and circular in shape, occupying the whole of the right posterior half of the abdomen. This body was so unwieldy that no definite conclusion as to its nature could be made.

Seen again on July 30th, the colt appeared little changed: temperature, 101° F.; pulse, 40; abdominal pain increasing, and the animal lying about continuously; the flank swelling slightly increased. As an aid to diagnosis trocar and canula were passed into the swelling in the flank. Withdrawal of the trocar was followed by the emission, at high pressure, of a clear yellow fluid, having a sickly fetid odour reminiscent of the smell associated with malignant œdema. With a view to diminishing pressure, about one quart of fluid was withdrawn.

*Diagnosis.*—A diagnosis of cystic testicular cord was now made, prognosis being very unfavourable, and surgical treatment was advised as a last hope. This was agreed to.

Prior to operation on the following day the colt appeared little changed: pulse, 60; temperature, 100·7° F.

*Operation.*—The colt was cast, chloroformed, and placed on his back. An incision was made over the right testicular cord, and this was dissected out, and followed into the abdomen, where the hand was immediately met by a huge tense, cystic tumour, with a thick fibrous wall, into which the cord disappeared. In order to diminish the

size of the cyst, trocar and canula were again introduced from the outside, and about one-and-a-half gallons of fluid allowed to escape.

An attempt was now made to separate the tumour from its surroundings, but it was found to be so firmly fixed by fibrous adhesions that the attempt was discontinued and the colt shot.

*Post-mortem.*—A *post-mortem* examination was made immediately, and revealed, as expected, a large, cystic tumour, having a strong fibrous outer coat, and firmly fixed by fibrous adhesions to the abdominal wall, large bowel and the right kidney. The right testicular cord entered this, and then disappeared in its structure. The outer coat was incised, and found to be about half-an-inch thick, the interior being filled with a yellow, jelly-like mass, and still containing a quantity of fluid. Examination of the cord showed it apparently healthy up to a point one inch away from the cyst; from this point onwards the centre appeared to be necrotic, and was very evil-smelling. The carcass was otherwise healthy.

The points of interest in this case, in our opinion, are that the testicular cord, external to the abdominal cavity, showed no unhealthy condition, during life or *post-mortem*, and that the castration wounds healed quickly and healthily.

## Plastic Operation for Paraphimosis in the Horse.*

**By J. Adamson, junr., Royal Veterinary College, London.**

*Subject.*—Bay cart gelding, aged ten years.

*History.*—The horse was found one morning in the field with his penis protruded and in a very swollen condition. Four days elapsed before advice was sought and probably the penis could have been reduced had immediate action been taken.

*Symptoms*—The prepuce proper was about one foot in diameter and œdematous. Unfortunately, organisation of the œdema had taken place and the whole structure was a solid mass. Warm, followed by cold, water was used extensively without any success towards reducing the structure.

*Diagnosis and Prognosis.*—The condition was recognised as one of paraphimosis and it was decided that an early operation would be necessary if gangrene was to be avoided.

*Treatment and Technique of the Operation.*—The horse was cast with hobbles and chloroformed, and the operation area cleaned with spirit. Sterile cloths were used to protect the site and held in place by means of towel clips. A calico bandage was used as a tourniquet and tied as near the root of the penis as possible. Another bandage was tied around the glans penis and an assistant held the penis extended. The area was painted with tincture of iodine. A circular incision was made through the skin three centimetres from the tourniquet. A similar incision was made five centimetres from the lower end of the new tissue. The two circular incisions were joined by a longitudinal incision on the left side of the penis. The skin and the œdematous tissue were dissected away from the penis without injury to the tunica albuginea. The tourniquet was removed and the circumference of the upper incision reduced to the size of the lower incision by cutting out two triangular flaps on each side of the penis, each being approximately three centimetres broad at the base, and four centimetres in perpendicular height. The lower circular incisions were brought together by means of ten strong silk sutures arranged around the penis. Each was placed so as to dip into the substance of the tunica albuginea for a length of one centimetre. A few double interrupted sutures were placed in addition when the previous ones had been drawn together.

The wound was dressed with tincture of iodine daily and the sutures were removed in ten days, with the return of the animal to work.

The tissue removed weighed three-and-a-half pounds.

* Cases presented for award under the N.V.M.A. Clinical Prize Scheme for Students, 1929.

## Metabolic Disturbance in a Hunter, with subsequent Degeneration of some of the Bones.*

**By J. Adamson, junr., Royal Veterinary College, London.**

*Subject.*—Thoroughbred brown mare, aged six years at the commencement of the case.

*History and Symptoms.*—The mare was in training for a Point-to-Point Steeplechase in February, 1928, but failed to get into condition, was indifferent in feeding and sluggish. Alterative medicine was given and she improved sufficiently to race.

In August, 1928, she contracted catarrh of the upper air passages with a watery discharge, and this continued for two months, during which time little change could be observed. She had not a good appetite and always played with her food, though periodically an improvement took place in food consumption. At the beginning of the season a five drachm aloes ball was given, but this had no effect, and was repeated in a week, with one drachm of calomel, with a similar experience. About this time it was thought that she had some degenerative change of the liver, as the visible mucous membranes were sometimes tinged with yellow.

The mare ceased to feed in December, 1928, and she received, per stomach tube, eight ounces of sodium chloride and one ounce of formalin in three gallons of water. This appeared to do her some good, as she commenced to eat and picked up in condition for about one month, when she again ceased to eat. The above treatment was therefore repeated, with good results until the end of February, 1929.

In March, 1929, she rapidly lost condition and was subjected to the tuberculin test, without any reaction. Throughout this period her pulse and temperature remained subnormal. Towards the end of this month she developed an œdema of the limbs and a condition resembling peripheral neuritis, as she flinched and objected to being touched. A course of magnesium sulphate and potassium nitrate was given.

On April 6th she was left at night in an apparently normal condition and on the following morning was noticed to be stiff behind, with a partial loss of control of the hind limbs. Shortly after being seen she sat down like a dog and

remained in this position for about 20 minutes, when she lay on her off side. Her pulse was 60 and weak; temperature 99·5°; visible membranes were pale, and a possibility of internal hæmorrhage was suggested. A hypodermic injection of five cubic centimetres of adrenalin hydrochloride was given, but all attempts to get her up failed. The following day her temperature was normal; pulse 40, mucous membranes not so pale, position the same, and she preferred to lie on the same side. On turning her over, the off hind quarter was seen to be greatly swollen and examination showed the femur to be fractured. This had probably occurred during the night, although the groom said she had not struggled. She was now destroyed.

*Post-mortem.*—On opening the abdomen one was struck by the anæmic appearance of the viscera. The liver showed extensive areas of fatty degeneration in the right lobe, which was friable, and the finger could be easily pushed through the capsule into the liver substance. There were fibrotic adhesions around the capsule of the kidney, which could only be imperfectly stripped off; on section, evidence of a former nephritis could be seen and in the right kidney there were multiple small abscesses containing thin, watery pus. The lungs were normal. The heart was greatly hypertrophied, possibly because of the resistance of the kidneys to the flow of blood. A bacteriological and pathological examination was not made of the kidney and liver.

There were extensive hæmorrhages in the Biceps Femoris muscle in both limbs, but none of the large arteries could be found ruptured. Both femurs were fractured below the articular surface and the shafts were in several pieces. Macroscopically no abnormality could be seen in the structures of the bones, and the pathologist's report stated that none could be found microscopically. The ribs were brittle and easily broken.

*Conclusions.*—This case seems, from its course and conclusion, to be due to some metabolic disturbance, but unfortunately chemical analysis was not made of the blood and urine during life. Some information might have been obtained from the composition of the bones after death. It would appear that the fracturing of the femora was secondary to the other disturbances.

The œdema of the limbs in March, 1929, could be associated with faulty heart action.

## The British Association.

The centenary of the British Association for the Advancement of Science, which has done so much to justify its title, is to be held in London next year, and in order to celebrate the occasion adequately and fittingly and to cover other undertakings such as the trusteeship of Darwin's house at Downe and grants in aid of scientific research, the President and leading officers have issued in the name and on behalf of the Council an appeal for contributions to the Centenary Fund, which should be forwarded to Sir Josiah Stamp, general treasurer, Burlington House, London, W.1. If contributors prefer to do so they can ear-mark contributions for particular purposes.

The relative susceptibility of the skin and subcutaneous tissues to *B. anthracis* is of considerable interest and may be of importance in solving the problem of a permanent immunity. It has been shown that a fatal dose of *B. anthracis* in the skin of a rabbit can be tolerated subcutaneously. A subcutaneous inoculation of a non-lethal dose produces an immunity to both dermal and transcutaneous inoculation in some animals.—*Jour. A.M.A.*, 10/24/25.

# Abstracts.

**Psittacosis: Pathology and Immunology.** Rivers, Berry and Rhoads (*Journal of the American Med. Assoc.*, August 23rd, 1930. Vol. 95, No. 8, p. 579.)]

Dr. T. M. Rivers, working at the Rockefeller Institute for Medical Research in New York, reported early this year that mice, rabbits and guinea-pigs were susceptible to psittacosis, but on this occasion no description of the pathological changes nor of the work on immunity was given.

The unfortunate infection of a member of the staff of the Institute later on in the year furnished useful experimental data, and Rivers, Berry and Rhoads now supply further information as a result of work they have since carried out. In this paper the effect of convalescent serum, both as a cure and as a prophylactic, is shewn. The authors state that the virus is in the fæces of infected parrots and also in a mixture of the materials obtained from the nose, mouth and crop. It is concluded from their work on monkeys that the virus may enter man by way of the nose and mouth and, with their experience of the human case of psittacosis, the virus is to be found in the sputum.

The following description of the pathology of psittacosis in parrots is given:—

"Parrot Liver.—*Gross Pathologic Changes*: The liver is usually larger than normal, with rounded edges, and has a yellowish tint indicating fatty degeneration. Frequently its surface is studded with white dots of varying sizes, some of which are surrounded by red areolæ. At times large areas of the liver are yellow, and are encircled by hæmorrhagic zones. Such lesions infect the edges of the organ and suggest infarcts.

"*Microscopic Changes*: The characteristic lesion of psittacosis in parrots consists of multiple, discrete areas of liver cell necrosis, distributed irregularly throughout the lobules but with a tendency to be more numerous near the edge of the organ. The condition appears to have its onset in the death of isolated liver cells of groups of cells; the cytoplasm becomes acidophilic and granular, and shrinks from contact with other cells. The nuclei become hyperchromatic and pyknotic, and eventually disappear completely. At this stage, mononuclear phagocytes and a few polymorphonuclear cells surround and infiltrate the lesion. As the process progresses, the necrotic liver cells disappear, leaving strands of acidophilic, hyaline material which may or may not show collections of leucocytes and depositions of fibrin. Often the areas of necrosis are so large that one is led to question whether they are the result of vascular thromboses. Striking alterations in the vascular channels are not usually seen, but in certain cases fibrin thrombi, involving the portal vessels, are found. In most cases only small vessels are occluded, but occasionally a large branch is involved. The question as to whether the areas of necrosis result from vascular thromboses or whether the thromboses are caused by the necrosis cannot be answered at present. When necrotic areas penetrate to the surface of the liver, accumulations of inflammatory cells are seen under Glisson's capsule and are doubtless the cause of the perihepatitis and peritonitis that are so often encountered.

" Throughout the organ there is a proliferation of Kupffer cells and focal accumulations of wandering mononuclear cells of the same general type. Some of these have a highly vacuolated cytoplasm containing masses of fat. Many plasma cells are also present.

" The bile ducts show a variable degree of involvment. In cases in which only small lesions are present, no reaction in these structures is observed. In the presence of extensive destruction of the parenchyma, however, there is an extremely active proliferation of the bile ducts.

" Parrot Spleen.—*Gross Changes* : The spleen is always greatly enlarged and very friable.

" *Microscopic Changes* : The normal architecture of the lymphoid follicles is almost completely obliterated, while the reticular and sinus structures are well preserved. The entire organ is densely infiltrated with wandering phagocytic cells which have a vacuolated cytoplasm containing amorphous débris, pigment and globules of fat. The increase in size apparently is due to the content of blood and the enormous number of mononuclear cells."

The authors summarise their work as follows :—

" 1. The virus of psittacosis is in the fæces and in the material collected from the nose, mouth and procrop of infected parrots.

2. Parrots and monkeys can be infected by intranasal instillations of the virus.

3. Parrots and rabbits that have recovered from a primary infection are refractory to reinfection.

4. It is not a simple matter to demonstrate neutralizing properties in convalescent human serum.

5. In parrots and in mice, the principal lesions occur in the liver and spleen.

6. Young monkeys (*Macacus rhesus*) are susceptible to intracerebral, intratracheal and intranasal inoculations of psittacosis virus. When it is instilled in the nose or injected in the trachea a characteristic pathologic picture occurs in the lungs which is similar to that observed in man."

G. W. D.

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[**Intravenous Injection and Air Emboli.** Grignani (*La Clinica Veterinaria*, 1929, p. 54).]

Experiments were carried out on calves, cattle, a horse and rabbits to learn the effects of the intravenous injection of air. It was found that small amounts, up to 10 c.cs. for large, and up to ¼ c.c. for a small animal (rabbit) could be borne without harm. With larger doses there occurs dyspnœa, which varies in degree with the air dose until the point is reached at which death takes place.

J. T. E.

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[**The Association of Bacterium Abortus Bang with Hygroma of the Knee of Cattle.** Boyd, W. L., Delez, A. I., and Fitch, C. P. (*Cornell Vet.*, 1930. July. XX, 3, 263).]

Hygroma involving the knee in the bovine species is a common condition, which has generally been regarded as a non-specific chronic inflammation affecting the bursæ. It has been suggested, however, that these swellings may have some association with *B. abortus*. For example, Bang and Bendixen succeeded in isolating this organism from a tendon sheath of an experimental cow 110 days after an intravenous inoculation. Other observers have noted that in herds in which contagious abortion is rampant, hygromata of the limbs are frequently encountered ; in fact, in Sweden they are often referred to as " abortion enlargements."

The authors of the present paper have noticed that cows affected with hygromata of the knees are often positive reactors to the agglutination test. They have been successful in isolating *B. abortus* from carpal swellings in two cows, which were strongly positive to the test, and had also aborted at some period during their life. The organism was obtained on several occasions from each animal, either by direct culture or by guinea-pig inoculation. They failed, however, to obtain the organism from two other reacting cows suffering from acute gonitis, which had also aborted. They suggest that *B. abortus Bang* may play a part in the development of certain forms of artheritis observed in aborting cows.

R. E. G.

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[**Methods of Dissemination of Anthrax.** Marchisotti, A. C., and Harispe, C. M. (*Rev. S.A. de Endocrin. Inmun. y Quimoterapia.*)]

The following is a summary of the conclusions drawn from a large number of experiments on wild animals, made with a view to finding out to what extent they may act as carriers of anthrax :—

(1) The vegetative forms of the *B. anthracis* are destroyed during their passage through the alimentary canals of carnivorous animals and birds.

(2) The sporulating forms, when ingested with the food, are eliminated in the fæces and their presence is easily established in cultures made from the fæces.

(3) Ingestion of meat and viscera from animals recently dead of anthrax (produced experimentally by feedings with vegetative forms) did not in one case lead to elimination of the bacteria in the fæces.

(4) Meat and viscera from animals dead of experimentally-produced anthrax were kept at a temperature of 37° C. for 24 hours. Feeding with this did not lead to elimination of the bacteria in the fæces. The process of putrefaction destroys the bacilli and sporulation does not occur.

In view of these facts the conclusion that forces itself upon one is that carnivora and carnivorous birds play an insignificant part in the dissemination of anthrax.

R. R.

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[**Filtrable Forms of the Tubercle Bacillus.** Marchisotti, A. C. (*Revista Sud-Americana de Endocrinologia, Inmunologia y Quimoterapia.*)]

About 28 experiments have been performed on guinea-pigs with a view to determining whether, in various cultures of the tubercle bacillus, the authors could establish the presence of ultravisible forms. The following is an analysis of the results :—

Injection of guinea-pigs with filtrates obtained from various cultures of the tubercle bacillus can cause, in a small percentage of cases, benign and localised lesions, with no tendency to generalisation. There is no justification for regarding these as tuberculosis lesions, except in those cases in which one has been able to establish the presence of the specific bacillus.

Re-inoculation of the lesions, whether they contain acid-fast bacteria or not, does not give rise to the same lesions as do the filtrates.

# N.V.M.A. Divisional Reports.

## West of Scotland Division.*

### Meeting at Glasgow.

A meeting of the West of Scotland Division, N.V.M.A., took place in the Veterinary College, Glasgow, on June 25th, 1930.

The chair was occupied by Professor George W. Weir, Glasgow, President of the Division, and there were present, in addition, Messrs. David Brown, Esmond Brown, Professor J. W. Emslie, Messrs. J. Johnston, Jas. Macfarlane, J. W. McGregor, Professor W. M. Mitchell, Messrs. Wm. Pierson (New Zealand), J. D. Pottie, Professor Wm. Robb, Messrs. A. H. Stark, Alex. Thomson, Peter Wilson, and D. Campbell (Hon. Secretary).

A number of students at the College also attended.

*Dr. Whitehouse.*—The President said that though Principal Whitehouse was not yet sufficiently recovered in health to be at the meeting, members would be glad to learn that he was now making steady, if not very rapid, progress. The minutes of the previous meeting, as printed in the *Veterinary Record* of June 21st, 1930, were adopted.

*Enrolment.*—Mr. John Donaldson Pottie, M.R.C.V.S., Greenock, was enrolled as a new member of the Division.

*Correspondence.*—A letter was read from the Secretary of the Eleventh International Veterinary Congress, suggesting that ladies and gentlemen attending the Congress might find it convenient to travel in parties from the various Divisions. It was decided that individuals should be left to make their own arrangements.

*Discussion.*

The next item on the agenda was "Discussion of the paper presented by Professor W. M. Mitchell, entitled 'Some Further Observations on Pathological Changes found in Horses affected with Shivering, and their Significance.'"

The President said that, on account of a family bereavement, on which they offered him their deepest sympathy, Professor Mitchell had been unable to attend their last meeting, and his paper was read in his absence. In these circumstances it had then been decided to postpone the discussion of the paper until it was suitable to have the essayist present. He was glad now, on behalf of the Division, to welcome Professor Mitchell. Members would have read the paper in the *Record* and would appreciate its importance and the scope it gave for discussion. Professor Mitchell had brought a number of specimens to illustrate his researches, and it would perhaps be desirable that these should be inspected before the discussion was opened.

Members then examined with great interest the numerous specimens displayed, which included macroscopic exhibits and microscopic sections. Following this interlude the discussion began.

[A report of the discussion is published earlier in this issue.—Ed.]

At its conclusion, the usual votes of thanks were accorded.

Tea was then served in the common-room of the College. During tea, on the initiative of Mr. Pottie, an informal, but exceedingly animated interchange of views took place on the subject of "Grass Sickness."

Donald Campbell, *Hon. Secretary.*

By injecting filtrates one cannot constantly produce lesions, and when lesions or enlargement of lymph glands are produced they may not contain tubercle bacilli.

The irregularity of these phenomena is such that contradictory results are produced in animals injected with the same culture and under identical conditions.

As yet it appears premature to speak of filtrable forms of the tubercle bacillus. Although the authors do not emphatically deny their presence, they do not feel that there is any experimental proof of their existence. They are more inclined to believe that the methods of filtration are imperfect.

R. R.

* Received on September 3rd.

## North of Scotland Division.*

### A Memorable Excursion.

A half-yearly meeting of the above Division was held on Saturday, September 6th, 1930, when members and friends spent a very pleasant day in the North of Scotland, with headquarters at Craigellachie.

There were present at the outing:—Mr. and Mrs. G. Howie, Mr. and Mrs. W. Macpherson, Mr. and Mrs. H. MacVean, Mr. Wm. Anderson, Mr. John Mitchell, Mr. and Mrs. D. Crabb, Mr. W. J. B. Robson, Mr. A. Sievwright, Miss Sievwright, and Miss Ballingall, Mr. J. B. Russell, Mr. Wilson and Miss Mitchell, and Mr. and Mrs. James McAllan.

The members met at Craigellachie, where lunch was served, and in the afternoon a drive took place up the Speyside to Tomintoul, which has the reputation of being the highest village in Scotland. Two hours were spent in Tomintoul, from which village many excellent views were obtained of the surrounding hills, dales, and rivers, in the glorious sunshine. After tea at Tomintoul, the return journey was made by Avonside to Craigellachie and, following supper, the members dispersed to their various homes. The weather during the whole excursion was delightful and some of the scenery through which the party passed could not have been finer. The outing, which was the first of the kind held by the Division for nine years, was voted by those present to be an extraordinary success. The arrangements locally were in the hands of Major MacVean, who was very heartily thanked for his efforts to make the day the memorably delightful event it proved to be.

The members of the Division had a short meeting—Mr. Howie, President, in the chair—at which the minutes of the last meeting, as they appeared in the *Veterinary Record*, were taken as read and duly approved.

Correspondence from the Secretary of the Scottish Branch, with regard to increasing the subscriptions to the Division for the purpose of creating a fund for the payment of the expenses to London of the Scottish members of the Council who have recently been elected, was read. It was decided to take no action in the matter meantime, but to bring up the correspondence at the next meeting of the Division.

J. McAllan, *Hon. Secretary.*

* Received on September 18th, 1930.

## Eastern Counties Division.

### Autumn Meeting at Woodbridge.

A meeting of the above Society was held at the Sun Hotel, Woodbridge, at 2.30 p.m. on Friday, September 19th.

There were present the President (Professor J. B. Buxton) in the chair, Messrs. T. J. Bosworth, T. G. Heatley, P. R. Turner, W. J. Browning, E. B. Reynolds, W. Shipley, V. Boyle, A. F. Castle, W. H. Wortley, H. Loveless, G. T. Matthews, B. A. Claxton, G. L. Bradley, C. C. Nesling, W. H. Dennett, W. Turtill, J. M. Buchanan and W. A. Wood, Hon. Secretary.

Letters of apology for non-attendance were received from Messrs. H. Buckingham, J. Buckingham, F. L. Gooch, W. Waters, H. Godbold, H. V. Low, M. Bray, J. Hammond, R. E. Glover, H. R. Allen, W. F. Loveless, S. H. Hill, J. Reid, J. Smith, J. F. Thurston, W. E. Wilkinson and H. L. Roberts.

*New Members.*—Messrs. C. W. Townsend, F.R.C.V.S., of Long Stanton and W. K. Townson, M.R.C.V.S., of Peterborough, having been duly proposed and seconded, were unanimously elected members of the Society.

*Correspondence.*—The Hon. Secretary read a letter from the Organising Committee of the N.V.M.A., suggesting that each Division should appoint a committee of three members willing to use their personal endeavour to induce non-members to join the N.V.M.A. This suggestion was adopted and Messrs. E. B. Reynolds, G. T. Matthews and W. H. Dennett were chosen to form the Committee.

*N.V.M.A. Provisional Committee.*—The formation of a Provisional Committee for next year's N.V.M.A. Congress at Norwich was now considered, and 24 names were selected for forwarding to the Council of the "National" for election as members of that Committee. These names included those of several members of the Lincolnshire Division that had been forwarded by the Hon. Secretary of that Division.

*Bowls Competition.*—The business part of the meeting being concluded, the members adjourned to the residence of Major and Mrs. Heatley, who entertained them to an excellent and most enjoyable tea, after which the annual competition for the Shipley Bowls Cup was very keenly contested, the winner being Mr. B. A. Claxton.

This cup was presented to the Society by the late Mr. W. Shipley, of Yarmouth, to be played for annually, and all money obtained by entries, etc., to be given to the Victoria Veterinary Benevolent Fund. The cup earned, on this occasion, £3 13s. 6d., which has been forwarded to that Fund.

The proceedings then terminated by a most hearty vote of thanks to Major and Mrs. Heatley for their kindness in giving the members such an enjoyable time.

W. A. Wood, *Hon. Secretary.*

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In the High Court of Leipzig it was recently decided that if the wife of a medical man gives first-aid to a patient during her husband's absence, as sometimes occurs in country practice, she alone is responsible for any mistakes she may make. If the medical man sends a bill to the patient he becomes responsible, for his wife is then to be regarded as his unqualified assistant.

# Administrative Report.

## Annual Report of the Canadian Veterinary Director-General.

The Report of the Veterinary Director-General of the Canadian Department of Agriculture for the year ending March 31st, 1930, is of considerable interest. This branch of the Department—The Health of Animals Branch—comprises three Divisions, each under veterinary control, namely, the Contagious Diseases Division, the Pathological Division and the Meat and Canned Foods Division. A detailed report by the Chief of each Division is incorporated in the Report.

The Report shows that there have been extensive outbreaks of disease in Canada during the year under review, but that the staff has been fully engaged on regular duties, which include a permanent progressive campaign in the control of bovine tuberculosis, and in safeguarding the Dominion from invasion of foot-and-mouth disease by enforcing restrictions on the importation of various commodities from countries where this disease is known to exist. In this last respect additional protective measures have been imposed during the past year. These measures control the importation of manure, fertilisers and foodstuffs containing animal matter, and second-hand sacks, and they prohibit the entry of vessels into Canadian ports carrying foreign animals as ship's stores, and they also prohibit the discharge of garbage or refuse into Canadian ports from ships from other countries.

Contagious Diseases Division.—With regard to disease in the country, no case of dourine has been detected for ten years and no case of sheep scab for two years. Anthrax was confined to the province of Ontario and only three deaths occurred. Three outbreaks of glanders occurred in Quebec and one in Saskatchewan, twenty horses being slaughtered and all contacts traced and tested with mallein. The swine fever situation was satisfactory, only twelve outbreaks being confirmed. This indicates considerable improvement on the previous year, when much trouble was experienced with this disease, particularly in Ontario. Mange in horses was detected only in New Brunswick and involved the treatment of nine horses. Cattle mange is also a scheduled disease in Canada and cases were reported from New Brunswick, Ontario, Manitoba, Saskatchewan and Alberta. Rabies was confined to the provinces of Ontario and Quebec, 96 cases being confirmed.

*Epizootic Abortion.*—A voluntary scheme is in operation for the control of epizootic abortion in cattle. Twenty-six owners have signed agreements asking for the assistance of the Government. Owners must employ their own veterinary surgeon to take blood specimens. These are forwarded to one of the Government Laboratories for agglutination and complement fixation tests. The owner is then advised of different methods of control, either by slaughter, or by segregation and sanitary measures. Owners entering the scheme are not allowed to dispose of reactors except for slaughter or to other stock owners, who are informed that the animals have reacted.

*Tuberculosis.*—Particulars are given of the progress of the scheme for eradication of tuberculosis. The principle

followed is the testing of cattle either in single herds under the Accredited Herd Plan or Supervised Herd Plan, with the slaughter of reactors and the extension of this policy to Restricted Areas. Applications from owners and districts for inclusion in this scheme are constantly increasing and greater difficulty is being experienced in arranging for the necessary tests at suitable periods in areas and in other places in which the percentage of infection has been reduced to practical limits.

The export of milk and other dairy products from Canada to U.S.A. is of considerable importance and officials of the Health Branch are working in co-operation with the U.S.A. Department to ensure that the U.S.A. regulations are properly complied with by Canadian exporters.

The Pathological Division.—This Division is responsible for research and investigational work, the manufacture of biological products and general laboratory service. There are four Institutions or Laboratories, one of which is devoted to poultry work.

In addition to research connected with scheduled diseases, two other diseases are mentioned as receiving special attention. Redwater causes considerable losses in cattle in parts of British Columbia and, at present, the causative factor has not been definitely determined. The experimental attempts to transmit the disease by contact or inoculation have not been successful. Infectious equine anæmia or "Swamp Fever" has been the subject of investigation for a number of years. The causative agent in this case appears to be a filtrable virus, and the blood of infected or recovered horses remains virulent for many years. The natural method of transmission, however, is not definitely known.

The Meat and Canned Foods Division.—The slaughter of animals, the preparation and handling of meat and meat products in all abattoirs engaged in inter-provincial and export trade are under the constant supervision of full-time, salaried veterinary officers and a system of *ante-* and *post-mortem* inspection is maintained. Prior to January last this inspection was confined to cattle, sheep, goats, swine, poultry, game, birds and venison, but recently a demand has arisen for horse meat, and suitable plants have been erected for the preparation of this commodity with a view to establishing an export trade. Such plants must be separate from those engaged in the preparation of other meats.

The staff of the Branch is common to the three Divisions, and when extra pressure arises in the Diseases Division, Inspectors are temporarily transferred from the Meat Division. Newly appointed veterinary inspectors are usually placed in the Meat Inspection Division and they are transferred to field work when they have gained experience. Reference is made in the Report to the fact that difficulty is experienced in obtaining suitable eligible veterinarians for the work of the Health of Animals Branch.

E. C. L.

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The International Institute of Agriculture states that in 1929 the Kingdom of Yugoslavia had 3,728,038 cattle, 1,140,343 horses, 106,117 asses, 15,469 mules, 7,735,957 sheep, 1,803,574 goats, 2,674,800 pigs, and 35,846 buffaloes.

# From The Veterinarian,

August, 1830.

## Communications and Cases.

### Pathological Facts and Observations.

By Mr. Castley, v.s., 12th Lancers.

No. III.

Of Strangles.

(*Continued from page* 933.)

Now, I myself have witnessed many curious facts relative to this disease, in my mind, not only fully bearing out Mr. Dick in these observations, but which I think would justify me in going a step further; from which I might be warranted in drawing the conclusion that what we call strangles may terminate in the formation of matter, either on any part of the surface of the body, or among the viscera of the abdomen, or, in short, anywhere.

Two cases of this sort occurred whilst we were at Canterbury the year before last; I thought them sufficiently interesting at the time to be put on record; and in now presenting them to my brethren, I have deemed these few preliminary observations necessary. I would only further remark that in some years we find strangles a much more violent and formidable complaint than it happens to be in general, or at other times.

During the summer of 1828 we recruited a number of young horses, the greater part of which were attacked, soon after joining the regiment, with a very *acute form* of strangles; characterised particularly by painful tumefaction of the *sublingual* glands, inflammation and suppuration along the course of the salivary ducts, and by the violent sore throat it often gave rise to. In some instances these symptoms were so severe as not only to prevent swallowing, but to obstruct the breathing in such a manner as even to threaten suffocation; truly putting one in mind of old Gervase Markham's description of this disease, and his definition of the origin of the term. "It is," says he, "a great and hard swelling between a horse's nether chaps, *upon the roots of his tongue*, and about his throat, which swelling, if it be not prevented, will stop the horse's wind-pipe, and *so strangle or choke* him; from which effect, and *none other*, the name of this disease took its derivation."

Towards the end of summer these attacks became less frequent, and also less violent. It was then I witnessed the two following variations from the usual course.

#### Case I.

A bay mare, four years old, joined in July, was admitted into the infirmary stable on August 4th, being very stiff and lame of the near hind extremity. The animal seemed to express much pain on moving; appearing to drag the limb, as if unable to get it forward. The following day a painful tumour began to make its appearance on the loose ply of skin forming the commissure of the flank, which slowly, but gradually, increased, until it became about the size of a cricket ball. In ten days matter pointed, and it was opened; and then another tumour of exactly the same sort began to make its appearance on the *opposite flank*. This is what fixed my attention to the case, and marked its constitutional character. They both went through exactly the same process. During the formation of these abscesses the animal seemed to suffer a good deal of pain and inconvenience. They were both ushered in by some degree of febrile disturbance; and they each discharged about a pint of thick purulent matter; after which the mare began to thrive and improve rapidly, and was discharged on September 10th.

In this case we had neither sore throat nor any catarrhal symptom whatever present; and yet I will not hesitate

to say, it was that kind of specific affection "to which horses appear by nature subject at one time or other of their life" (*Percivall's Lectures*); and "whose natural cure seems to be a suppurative process" (*Blaine's Outlines*). In short, that specific movement of the system which we, for want of a better term, continue to call strangles.

**Case II.**

A brown mare, three years old, which had joined in October, was admitted into the hospital stable on November 4th, showing symptoms of strangles, tumefaction of the glands, with soreness of the throat, and slight constitutional disturbance. Was treated in the usual way. A large abscess soon formed under the jaw, which was opened; and there appeared to be nothing particular or worthy of remark in the case; it seemed to run a regular course, and the mare was sufficiently well to be discharged on the 15th, at that time in good spirits, her appetite good, and the abscess nearly healed. She was re-admitted on the 28th of the same, then exhibiting the following symptoms—great dejection of spirits and debility, loss of appetite, staring coat, the hair of the mane and tail loose, and easily pulled out, and it was observed that the animal's breath stank most offensively. She had a small but not accelerated pulse. Her breathing was tranquil, and bowels free. She was placed in a loose box stable, ordered soft food, and the following drink: chloride of lime (concent. solut.) ʒi. Spts. Nit. Æther ʒiij, in two pints of Infus. Quassia. The draught was repeated, and seemed in a great measure to correct the fetor of the breath; but in other respects the patient remained nearly in the same state. We observed that she sometimes turned her head round and looked back, towards her flank, for a considerable time together; but this was done in such a quiet and gentle manner as not to be considered expressive of active pain. Tonics and diaphoretics were administered daily; and under this treatment the mare's appetite seemed to improve. She laid down regularly, the extremities kept warm, the animal functions appeared to be going on uninterruptedly, and there was apparently but little constitutional disturbance. Still every now and then we observed her head turned round, and pointing towards the left flank, indicating something wrong going on in that quarter—some visceral derangement difficult to make out. The symptoms continued nearly the same until December 2nd, when they all became rapidly worse: increased debility, disturbed breathing, weak small pulse at 60, appetite failing. On the 3rd, still growing worse, and on the morning of the 4th, we found the mare unable to rise, her body covered with cold sweat, pulse scarcely perceptible. She died about 12 o'clock the same day.

*Post-mortem Examination.*

On opening the abdomen a quantity of dark-coloured serous fluid either escaped or was seen amongst the interstices of the bowels. The surface of the large intestines exhibited strong marks of recent inflammation. The blind end of the cæcum was found adhering, with a broad and thickened basis, to the side of a *large tumour* which had formed in the mesocolon. A part of the colon itself, near its anterior curvature, was likewise found firmly attached to this tumour; and from these two points of attachment might be seen red streaks or traces of inflammation running along the peritoneal covering and ligamentous bands of the cæcum and colon. In the centre of the tumour was an abscess, filled with a thin purulent matter. Its walls were from two to three inches thick, and seemed to consist of dense cellular substance. In the colon was seen a considerable quantity of food; and digestion appeared to have been going on regularly enough. All the rest of the abdominal viscera, as well as the contents of the chest, exhibited a sound appearance.

The tumour or abscess, then, which we have seen had been formed in the mesentery, was, without doubt, in this instance, the immediate cause of death. And I can feel no hesitation in calling this one of the sequelæ of strangles.

One thing, I may remark, struck me as appearing somewhat extraordinary in this case, which was the little interruption that seems to have been given to the process of digestion, considering the nature of the mischief that was going on amongst the bowels.

I could bring forward many other instances in suppor. of what I have advanced; I shall only mention one more, and which is of very recent occurrence.

**Case III.**

A bay gelding, four years old, joined the regiment in April last, from Durham fair; was admitted into the infirmary stables, Royal Barracks, Dublin, on the 7th of May, then shewing what might be called only slight catarrhal symptoms; having a cough, but unaccompanied with any tumefaction of the glands or sore throat, and without loss of appetite, or much apparent disturbance of the system. He was placed in a box stable, ordered soft food, and had some doses of alternative medicine given at intervals; but the cough continued, and was at times very troublesome during the whole month. About the beginning of June a tumour began to make its appearance under the jaw; a small abscess formed, and was opened on the 9th. Then another appeared on the right cheek, which was punctured on the 15th. About this time, the upper part of the near fore leg was attacked with phlegmonous inflammation, which was followed by a large collection of matter amongst the muscles of the arm; and this abscess was opened on the 20th. In the meantime, a large tumour had arisen upon the hind quarter of the same side nearly over the hip joint. Matter pointed, and it was opened on the 29th. These two last abscesses discharged a large quantity of very thick pus. Since then the horse has been advancing rapidly in convalescence; his appetite keen, and his spirits good. Here we have an instance of four distinct formations of matter on different parts of the surface, all, no doubt, arising from the same cause. And this subject, it should be remembered, was troubled with an obstinate cough for more than a month prior to shewing any visible symptom of strangles.

The points I have in view, and which I think these facts have a tendency to prove, are—first, that strangles is perhaps a more complicated disease than most people appear to be aware of; and, secondly, that it may end in the formation of an abscess, not only *on* any part of the body, but amongst the visceral organs; in fact, anywhere.

In these observations I hope to be borne out by the experience of others. For the present I have done.

Dublin.

*July 9th*, 1830.

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**Maintenance of Tubercle-free Herds.**

"It is no good pretending that the maintenance of tubercle-free herds is easy," says *The Lancet* of September 27th. "It might, perhaps, be well to have a pooling of experience or round-table conference of veterinary surgeons who have actually had experience of trying to keep herds free from tubercle—to be followed by an investigation of how other countries (such as the United States, Canada, and Denmark) are faring in this campaign. The island of Guernsey has tubercle-free cattle and a more or less normal death-rate from human tuberculosis. It would be interesting to know if the cows in Guernsey are ever accidentally infected from a human source. Such an investigation would be of world-wide interest, and might secure support from a body like the Rockefeller Foundation."

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Speaking at the annual congress of the Royal Sanitary Association for Scotland, Professor Leitch said:—"If they had regard to the incidence of tuberculosis in the dairy herds of Great Britain, the annual loss to the industry which that disease entailed, and the possibility of eliminating it altogether, it seemed surprising that a national campaign for its eradication should be so long delayed. Some veterinary authorities estimated that at least 30 per cent. of dairy cows in this country were reactors; others would place the figure much higher. A recent statement that Britain's annual loss from this disease amounted to over £1,000,000 was calculated to cause one to furiously think."

## Army Seniority.

Precedence of Regiments and Corps.

The King has approved a new table of the order of precedence for corps and regiments in the land forces, and an amendment (No. 29) has been circulated to the Army, altering paragraph 675 of King's Regulations, which gives the precedence table hitherto in use. The table, now amended, attained its form over a period going back to the Restoration, and a close examination at the War Office has removed some anomalies and adjusted the precedence in accordance with regimental history.

In the new table the fighting formations remain in their old order, but immediately below them is now inserted the name of the Royal Malta Artillery, this being a restoration of a position formerly accorded. Next to the Regular fighting corps is now placed the Royal Army Chaplains' Department, and this advance in precedence is due to the fact that chaplains were a formed body in 1796, or 50 years ahead of the oldest of the administrative corps. The Royal Army Pay Corps, having been formed in 1893, goes above the veterinary and education services. The home Militia has been regrouped by placing the Royal Monmouthshire R.E., the Supplementary Reserve and the Militia in that order. The militia units abroad are placed below instead of above the Territorial Army, and with the latter is now added the T.A. Nursing Service. The new order of precedence is as follows:—

1. Life Guards and Royal Horse Guards.
2. Royal Horse Artillery.
3. Regiments of Cavalry of the Line.
4. Royal Regiment of Artillery (except R.H.A. and local companies abroad).
5. Corps of Royal Engineers.
6. Royal Corps of Signals.
7. Regiments of Foot Guards.
8. Regiments of Infantry of the Line.
9. Royal Tank Corps.
10. Local Companies of R.A. abroad.
11. Royal Malta Artillery (from 16th place).
12. Royal Army Service Corps.
14. Royal Army Medical Corps.
15. Royal Army Ordnance Corps.
16. Royal Army Pay Corps (from 19th place).
17. Royal Army Veterinary Corps.
18. Army Educational Corps.
19. Army Dental Corps.
20. Queen Alexandra's Imperial Military Nursing Service.
21. Royal Monmouthshire R.E. (from 23rd place).
22. *Supplementary Reserve (from 26th place).
23. *Militia.
24. Hon. Artillery Company.
25. *Territorial Army (from 26th place).
26. Territorial Army Nursing Service.
27. *Militia units in Bermuda, Channel Islands, and Malta.
28. Officers Training Corps.

* In order of arms as for Regular Army.

The R.H.A. takes precedence immediately after the Household Cavalry, but on parade with guns it takes the right of the line and marches at the head of the Household Cavalry. At one time the R.H.A. appeared in the table above the Household Cavalry. The Royal Marines rank among Infantry after The Royal Berkshire Regiment, taking date between the raising of the 49th and 50th Foot, in permanent continuation of the old maritime regiments.

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The Council of the National Farmers' Union endorsed a resolution expressing "bitter disappointment that the Government's published agricultural policy contains no measures to meet the immediate needs of the critical position of the industry," and it asked for the immediate legislation which was essential for a large number of farmers to carry on.

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The Irish Free State Government, owing to the foot-and-mouth disease outbreaks in this country, have suspended the importation of all live stock from England and Wales until further notice.

## Swine Fever.

Disease Increasing in Suffolk.

As a result of a discussion which took place at a special meeting of the Suffolk Diseases of Animals Joint Sub-Committee, at the County Hall, Ipswich, a special Committee was set up to consider the reports from the districts relative to swine fever in the county, with instructions to report at a meeting to be held shortly.

Speaking of swine fever, the Chairman (Mr. C. C. Smith) said that their chart of the county presented rather a bad appearance, the disease being on the increase.

Asked to express an opinion, an official of the Ministry of Agriculture said that the Ministry was getting rather worried about it, and were anxious to know the local authority's opinion. Although the area had diminished, there were more cases than before round Hadleigh and across country to the Woodbridge division.

Giving detailed information, the Chairman said that since September 3rd there had been 107 reports received, 24 of which had been confirmed, while 39 were awaiting determination. The other 44 were not swine fever. Twenty-two parishes were affected in East Suffolk, and twelve in the West, the Northern part of the county being nearly free. The chief trouble appeared to be in the neighbourhood of Hadleigh and Woodbridge.

Mr. C. S. Skinner suggested that a ring should be drawn round the infected areas, and the movement of the animals prevented.

Mr. Arthur Symonds: Part of the trouble is the leniency of the Magistrates.

During the course of further discussion, Lord Cranworth remarked that they must either tackle the question wholeheartedly or not at all. If they were satisfied that it was serious, that must close the whole county.

Mr. Skinner protested that this step would affect that part of the county in which they were practically free from the disease equally with those districts in which it was prevalent. He moved that the district from Hadleigh to Woodbridge be made an infected area.

To this there was no seconder.

Mr. J. W. Rickeard then proposed the formation of a small committee to consider all the reports which had been received, and, as stated above, to this the meeting agreed.

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Schemes for putting milk on the London market—or on London streets—direct from the farms are under consideration in several districts. The projected enterprises have been criticised, if not actually ridiculed, but men in desperation are not easily baulked, and anything seems better than putting the milk down the drains. The pioneers may encounter difficulties that are not as yet visible, but if they can retail their milk in London at 5d. a quart—1s. 8d. a gallon—they will probably get plenty of purchasers. In any case, their action inspires confidence and hope in their versatility and disproves effectively the popular charge of incapacity and defective enterprise on the part of farmers. Complaints are unusually numerous regarding either the terms of the recent settlement or the manner in which they have been interpreted in practice by the distributors. To make things worse, the increased use of milk powder by sections of the Services, and the discontinuance of supplies of liquid milk, is reported. The authorities at Halton Camp, Bucks, may be acting in conformity with those at other stations, but the substitution of milk powder for liquid milk there has aroused keen disappointment in the locality.—*The Times.*

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The Paris Correspondent of the *Lancet* expresses astonishment at the fact that we have never attempted to develop by selective breeding the rat-catching propensities of cats. "Such has been the misconceived breeding of cats to fit them rather for the requirements of companionless spinsters than for the destruction of rats," he writes, "that a rat-indifferent or a rat-fearing cat is no uncommon sight." Apparently Dr. Loir, Medical Officer of Health, Havre, has been breeding cats for rat-catching for four years.

# Notes and News.

The Editor will be glad to receive items of professional interest for inclusion in these columns.

## Diary of Events.

Oct. 13th.—Meeting of the Editorial Committee, N.V.M.A., at 2 Verulam Buildings, Gray's Inn, W.C.1, 4.30 p.m.

Oct. 15th.—Meeting of the West of Scotland Division, N.V.M.A., at Glasgow.

Oct. 17th.—Meeting of the Mid-West and South Wales Division, N.V.M.A., at Bridgend.

### Personal.

*Will.*—Tainsh, Mr. John James, of Ivydale, Abbey Road, Grimsby, veterinary surgeon (net personalty £8,074), £9,165.

. . . . . .

*The Mayoralty of Tamworth.*—We understand that the Mayor of Tamworth (Captain W. Tempest Olver, J.P., M.R.C.V.S.), has received a unanimous invitation from the Town Council to continue as Mayor for a second year. The Mayor has accepted the invitation.

. . . . . .

*Appointments.*—Mr. J. T. R. Evans, B.Sc., M.R.C.V.S., will shortly be leaving this country to take up an appointment as an Assistant Veterinary Research Officer under the Sudan Government.

Mr. John M. McDonald, M.R.C.V.S., has been appointed Assistant Veterinary Inspector to the Ayrshire County Council.

### R.C.V.S. Obituary.

Rowe, James, 65 High Street, Marylebone, London, W.1. Graduated, London, April 20th, 1868. Died October 4th, 1930, aged 82 years.

The above notice, which we received with the greatest regret, has reached us shortly before going to press. We hope to publish, next week, an appreciation of one who was a familiar and venerated figure to all his veterinary colleagues in London and the Home Counties. It is but a short while since that the Fellows of the Central Veterinary Society awarded Mr. Rowe their Victory Medal in recognition of his long and valued membership.

### The Guildhall Luncheon.

The reference in our issue of last week to the election of Alderman Phené Neal as Lord Mayor of the City of London, immediately preceding, as it did, our account of the luncheon at Guildhall given by Sir Frederick Green to meet the Lord Mayor and Sheriffs, gave the erroneous impression that Alderman Neal, and not his predecessor, was the Lord Mayor concerned with the latter function. Amongst those present, in addition to those mentioned, were Mr. G. P. Male, past President of the N.V.M.A.; and Professor J. B. Buxton, General Secretary of the International Veterinary Congress, of the Special Reception Committee of which Sir Frederick Green was Chairman.

# Correspondence.

**Letters to the Editor should reach the Office not later than by the first post on Tuesday morning for insertion in following Saturday's issue.**

All correspondence must bear the name and address of the contributor for publication.

The Editor does not hold himself responsible for the opinions of his correspondents.

### 1. Milk Fever; 2. Tetanus.

To the Editor of The Veterinary Record.

Sir,—1. Following on my comments on my experiences with the treatment of milk fever with calcium gluconate, I have received requests for information regarding the preparation that I found to be successful in one of the cases reported by me in my original article in the *Veterinary Journal*. As this preparation has now been on the market for some weeks, and has been advertised for this purpose, I can now disclose that it is a sterile solution of colloidal calcium with Vitamin D (Calcium-Vetostelin). As to whether this has been successful in every case, this has not been so, and, in severe cases, I have found that an intravenous injection of a sterile solution of calcium chloride is the most reliable, and this has proved successful when other calcium preparations have failed. The best preparation is an American one, and I shall be pleased to give the name of the makers to any practitioner who cares to write me. Great care must, of course, be taken to ensure that all of the injection goes into the jugular vein and not outside it; in view, however, of the ease with which the vein can be raised, and the usual comatose condition of the animal, this is an easy matter, but I advise the injection (which, of course, should be heated to blood heat before use) to be carried out slowly with a good sized syringe in preference to the tedious method of funnel and tubing.

(2) I was interested to read Major Ascott's comments on the use of tetanus antitoxin, and whilst agreeing with him that its employment when symptoms have once started is of little avail (although good reports are stated if large doses are given), I do not agree that its use as a prophylactic is over-rated. I have made it a rule always to inoculate every case of foot or barbed wire wounds, or wounds caused by contaminated material, or likely to be contaminated by excreta, etc., with tetanus antitoxin, and I have only had one case develop tetanus afterwards: this was just after the War, in a case of broken knees. Symptoms in this case developed six weeks after inoculation, but recovery was uneventful.

On the other hand, I find that the great majority of tetanus cases encountered are due to such injuries as picked up nail, and pricks, when this very reliable and "cheap insurance" against it has been neglected.

Tetanus antitoxin was not issued to any R.A.V.C. unit to which I was attached during the War, and perhaps, as Major Ascott remarks, it was stopped for some economic or other reason. It must, however, be remembered that such wounds, of course, usually received far quicker and more antiseptic treatment from the R.A.V.C. than such cases do from the owners in civilian life.

Yours faithfully,
J. F. D. Tutt, M.R.C.V.S.

1, St. Cross Road,
Winchester.
*September 24th*, 1930.

### Disappointed Tuberculosis Zealots.

To the Editor of the Veterinary Record.

Sir,—Various statements have recently appeared in the *Veterinary Record* which must not be allowed to pass uncontradicted, as otherwise we shall become a laughing stock in the eyes of foreign countries. At the Royal Sanitary Institute Congress held at Margate, at which the President devoted a lot of time in his Presidential Address to the subject of tuberculosis, Alderman and Sheriff W. Phené Neal, when speaking as a layman, submitted for consideration and discussion, for the eradication of tuberculosis, a method based partly on such a means as that employed by the President, Major-General Sir John Moore, during the Great War, saying that Sir John Moore had eliminated all horses over 15 years old as unfit for further service. Of course, this statement is entirely erroneous. There is a great percentage of horses that can do their work perfectly well when they are over 15 years of age.

I have just returned off manœuvres and 20 per cent. of the horses in my Regiment were 15 years old and over and they did their work well. Quite recently enormous prices have been given for polo ponies that were 15 years old and over. Again, the well-known International Horse jumpers " Broncho " and " Combined Training " won at Olympia when over 15 years old.

It is also ridiculous, in my opinion, for a layman, and worse still for a veterinary surgeon, to say that because glanders has been eradicated amongst horses by the use of the mallein test it ought to be equally easy to eradicate tuberculosis amongst cattle by the tuberculin test. If they doubt my word, I hope they will keep a herd of 50 cattle, and test them every four months, kill all the reactors, replace them every time with fresh ones, that have passed the tuberculin test, and in five years express their views on the subject. During the five years they would probably find that it is not easy for the average farmer (*a*) to separate all calves from their dams at birth and feed them on pasteurized milk, or (*b*) not to allow calves to graze with other cows or (*c*) to keep them in hygienic sheds, free from contamination. At the same time these enthusiasts would learn something probably of the following diseases which are the cause of such heavy financial losses to the dairy farmer; 1. Johne's disease; 2. sterility; 3. mastitis, both the ordinary mastitis and the summer mastitis.

I have not mentioned contagious abortion, with its frequent *permanent* sterility following. This disease probably causes more financial loss than *all* the other diseases put together—running into millions of pounds a year, the United States reckoning the loss at 50 million dollars (£10,000,000).

Yours sincerely,

*October 3rd*, 1930. Graham Rees-Mogg.

### The Transvaal Civil Veterinary Department.

To the Editor of The Veterinary Record.

Sir,—It has been interesting to read the article on " The Veterinary Profession in South Africa," particularly with regard to the veterinary organisation in the Transvaal after the South African War, 1899-1902. This has shown how short memories of events are. It is stated on page 909 of the *Veterinary Record*: " It must therefore be emphasised that the first District Veterinary Surgeons of the Colonies were officials not of the Department of Agriculture, but of the temporary Repatriation Departments organised immediately after the second Boer War, 1899-1902."

Although in another paragraph it is stated that no official Records were available, yet the statement regarding the first appointments is intended to be incontrovertible. This statement regarding appointments has surprised me, as I have veterinarians in mind who received appointments with the Transvaal Government—one as early as December, 1902—who were not attached to, or in the pay of, the Repatriation Department.

Reports at the commencement were forwarded to the P.V.O., S.A.C., who at that time was Major Sanderson; likewise instructions were issued by him. While some of the veterinarians employed by the Repatriation Department obtained appointments at a later date with the Transvaal Government, their duties were to look after the animals and interests of the Repatriation Department. As the Civil Organisation progressed, if an outbreak of a scheduled disease occurred among animals of the Repatriation Department, the Government Veterinarian exercised official supervision. I consider it would have been better to have omitted the list of names given than to give an incomplete one and do injustice to other pioneer members.

Yours faithfully,

Halifax. J. Pollard.

*October 4th*, 1930.

*The Editor acknowledges the receipt of the following*:—

Report of a meeting of the Midland Counties Division, N.V.M.A., from Mr. H. J. Dawes, Hon. Secretary.

Communications from Major T. F. Arnold (Mona, Punjab), Messrs. J. T. Edwards (Weybridge), T. Eaton Jones (Liverpool), and H. E. Smithers (Edgware).

# Diseases of Animals Acts, 1894 to 1927.

## SUMMARY OF RETURNS.

| Period. | Anthrax. | | Foot-and-Mouth Disease. | | Glanders (including Farcy).§† | | Parasitic Mange.§ | | Sheep Scab. | Swine Fever. | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Outbreaks confirmed. | Animals attacked. | Outbreaks confirmed. | Animals slaughtered as diseased or exposed to infection. | Outbreaks confirmed. | Animals attacked. | Outbreaks reported by the Local Authorities. | Animals attacked. | Outbreaks confirmed. | Outbreaks confirmed. | Swine slaughtered. |
| | No. | No. | No. | No. | No. | No. | No. | No. | No. | No. | No. |
| Period 16 to 30 Sept., 1930 | 9 | 10 | 2 | 140 | — | — | 6 | 9 | 5 | 75 | 45 |
| Corresponding period in— | | | | | | | | | | | |
| 1929 ... | 11 | 11 | 1 | 46 | — | — | 8 | 9 | 1 | 165 | 95 |
| 1928 ... | 17 | 20 | 6 | 1,072 | 1 | 1 | 1 | 1 | 13 | 33 | 7 |
| 1927 ... | 16 | 16 | 2 | 140 | — | — | 11 | 13 | 14 | 44 | 22 |
| Total 1 Jan. to 30 Sept., 1930 | 282 | 310 | 7 | 298 | — | — | 178 | 268 | 298 | 1,851 | 783 |
| Corresponding period in— | | | | | | | | | | | |
| 1929 ... | 333 | 415 | 27 | 2,685 | — | — | 171 | 338 | 374 | 1,790 | 1,056 |
| 1928 ... | 417 | 479 | 113 | 10,001 | 1 | 1 | 231 | 443 | 364 | 1,175 | 597 |
| 1927 ... | 318 | 380 | 33 | 2,930 | — | — | 294 | 483 | 446 | 1,291 | 611 |

Note.—The figures for the current year are approximate only.

† Including outbreaks in recently imported animals.

§ Excluding outbreaks in Army Horses.